

# The Association of Sexual Behaviors With Socioeconomic Status, Family Structure, and Race/Ethnicity Among US Adolescents

## ABSTRACT

**Objectives.** This study assessed the relation of socioeconomic status (SES), family structure, and race/ethnicity to adolescent sexual behaviors that are key determinants of pregnancy and sexually transmitted diseases (STDs).

**Methods.** The 1992 Youth Risk Behavior Survey/Supplement to the National Health Interview Survey provided family data from household adults and behavioral data from adolescents.

**Results.** Among male and female adolescents, greater parental education, living in a 2-parent family, and White race were independently associated with never having had sexual intercourse. Parental education did not show a linear association with other behaviors. Household income was not linearly related to any sexual behavior. Adjustment for SES and family structure had a limited effect on the association between race/ethnicity and sexual behaviors.

**Conclusions.** Differences in adolescent sexual behavior by race and SES were not large enough to fully explain differences in rates of pregnancy and STD infection. This suggests that other factors, including access to health services and community prevalence of STDs, may be important mediating variables between SES and STD transmission and pregnancy among adolescents. (*Am J Public Health.* 2000;90:1582–1588)

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Socioeconomic status (SES), as measured by family income or educational attainment, is associated with many measures of health status, including adult and child mortality rates,<sup>1–3</sup> and reproductive health outcomes such as unintended pregnancy,<sup>4</sup> adolescent birth rates,<sup>5,6</sup> and infant mortality.<sup>7</sup> Previous studies of adolescent birth rates demonstrated a strong inverse relationship with measures of SES such as poverty; less is known about the relationship between adolescent rates of STD infection and SES. SES may influence health by circumscribing social and educational opportunities, limiting access to prevention and treatment services, and shaping health behaviors.

Adolescent birth rates are strongly associated with poverty. In 1988, 17% of adolescent women aged 15 to 19 years were poor, while 56% of teen births occurred to young women who were poor.<sup>5</sup> In contrast, higher-income adolescents accounted for 56% of the population but only 17% of the births; the birth rate among poor women aged 15 to 19 years was almost 10 times the rate among higher-income adolescents. Wu,<sup>8</sup> using data from the National Longitudinal Survey of Youth, found that family instability, income, and change in income were independently related to the risk of premarital birth. Higher SES, as measured by parental education, has also been associated with a decreased probability of adolescent pregnancy.<sup>9</sup> Using data from the National Survey of Adolescent Men, Ku et al.<sup>10</sup> found divergent effects of SES on pregnancy; higher family income, higher neighborhood unemployment, and increased adolescent employment were all independently associated with greater risk of a young man impregnating a woman. Very limited data are available for assessing rates of sexually transmitted diseases (STDs) by SES. In examining rates of gonorrhea and chlamydia among adolescents in San Francisco, Ellen et al.<sup>11</sup> found modest effects of SES but large differences by race/ethnicity.

Rates of adolescent birth, pregnancy, and STD infection are higher among racial and eth-

nic minority groups, and these differences are often attributed to poverty, which is more common among these groups.<sup>6,11</sup> Nationally reported rates for gonorrhea are 31 times higher among Black than among White adolescents<sup>12</sup>; birth rates among adolescents aged 15 to 17 years are 3.2 times higher among Blacks than among non-Hispanic Whites.<sup>13</sup> Data on gonorrhea from London reveal relatively modest differences by socioeconomic deprivation but relatively large effects by ethnicity.<sup>14</sup>

The association between social factors and adolescent childbearing and STD infections may be explained by a small group of proximate behavioral risk factors.<sup>15,16</sup> For childbearing, these key proximate factors include age at initiation of sexual intercourse, frequency of intercourse, use of contraception, and decisions about pregnancy continuation. For STD infection, key factors include age at initiation of sexual activity, having multiple sexual partners or a partner with multiple partners, use of barrier protection, and use of diagnostic and treatment services for STDs. STD risk is also related to the community prevalence of the STD infection; community prevalences for bacterial STD infections reflect the cumulative impact of access to treatment services. Inadequate access to treatment services over time would be expected to greatly increase the prevalence of STDs that can be effectively treated with antibiotics. Among adolescents, reported rates for certain STDs have increased, whereas rates of others have decreased, in the past 2 decades. These changes have been influenced by dramatic increases in the proportion of adoles-

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cents who were having sexual intercourse in the 1970s and 1980s,<sup>15,17</sup> dramatic increases in condom use in the 1980s and early 1990s,<sup>18,19</sup> a trend toward marrying at an older age, and a diminished difference between Whites and Blacks in rates of premarital sexual intercourse between 1970 and 1988.<sup>20</sup>

Although SES may be a risk factor for adolescent pregnancy and STD infection, the impact of poverty on sexual behaviors is not well understood. Previous US studies dating back to the 1940s documented an association between lower SES or family factors and earlier onset of sexual activity.<sup>21–23</sup> Hofferth,<sup>6</sup> in reviewing research from the 1970s, reported that parental educational attainment was a more important predictor of sexual experience than family income in several studies. Compared with living in a 2-parent family, living in a single-parent family has been associated with an increased probability of early initiation of sexual intercourse,<sup>24</sup> which may reflect decreased parental supervision, more permissive parental attitudes, or the coincidence of poverty and single-parent families.<sup>6,21,24</sup> Contraceptive use at first intercourse is also associated with poverty status and race/ethnicity.<sup>21</sup> The data available for assessing the influence of SES on other sexual behaviors, such as current sexual activity, current use of contraception and barrier protection, and number of sexual partners, are more limited.<sup>6,21</sup> Ku et al.<sup>10</sup> found that greater family income was associated with increased frequency of intercourse and increased number of sexual partners but not with use of effective contraception for older male adolescents. Data from the 1988 National Survey of Family Growth<sup>21</sup> showed a nonlinear relationship between family income and current use of contraception. Contraceptive use was lower among adolescents from low-income (but not poor) families than among adolescents from either poor or higher-income families.

Differences by race/ethnicity are found for some, but not all, adolescent sexual behaviors. Black and Hispanic adolescents are more likely to report early initiation of sexual intercourse than are White adolescents.<sup>25,26</sup> Although overall contraceptive use is similar among Black and White adolescents, Black adolescents are more likely than White adolescents to use implant and injectable contraception.<sup>27</sup> Condom use among high school students is higher among Black adolescents than among Whites; the reverse is true for oral contraceptive use.<sup>28</sup> It is unclear how many of these racial and ethnic differences can be attributed to SES.

Measuring SES among adolescents presents several challenges.<sup>29</sup> SES measures that have been used in adult populations—including household income, educational attainment, and occupational status—are less usefully applied to adolescents. (It should be noted that these measures are imperfect when used with adults.)

Among adolescents, educational attainment and occupation are not useful measures of SES, because most adolescents have not yet completed their schooling and work at part-time or entry-level jobs. Further, adolescents may not be reliable reporters of family income or parental educational attainment. A meaningful way to measure the SES of an adolescent is to use a parent's report of the SES of the family. This method, however, creates problems in linking the parent's report of SES measures with the adolescent's report of sexual behaviors.

The 1992 household administration of the Youth Risk Behavior Survey (YRBS) offered a unique opportunity to examine associations between SES, as reported by family adults, and sexual behaviors that place adolescents at risk for STDs and pregnancy, as reported by adolescents. Our primary research question examined the relationship of SES, family structure, and race/ethnicity to specific adolescent sexual behaviors. A second question explored how the relationship between race/ethnicity and sexual behaviors was modified when the effects of SES and family structure were controlled for.

## Methods

The 1992 YRBS was conducted as a follow-back survey to the 1992 National Health Interview Survey (NHIS).<sup>30</sup> The YRBS provided information from adolescents on reported sexual behavior, and the NHIS provided data from household adults (usually parents) on family income, adult educational attainment, family structure, marital status of the adolescent, and race and ethnicity. The NHIS is an annual household survey of the civilian, noninstitutionalized adult population of the United States.<sup>31</sup> It uses a multistage, cluster-area design to obtain data representative of the US population. Minority families were oversampled in the NHIS. The 1992 NHIS was used to enumerate all youths aged 12 to 21 years from sampled households, including those youths who were married and those living away from their family of origin. Youths were randomly selected from this list; those out of school were oversampled. Data were weighted to adjust for non-response and oversampling. Audiocassettes were used for data collection in the YRBS; adolescents listened with headphones to a tape recording of the questionnaire and then recorded their responses on a scannable answer sheet. This method was used to address potential adolescent concerns about privacy with in-home interviewing.

Of the 13 789 youths aged 12 to 21 years who were selected from the NHIS household lists, 10 645 (77%) were located and agreed to be interviewed. The questionnaire used for 12- and 13-year-olds did not ask about sexual behavior. Because the adult completing the core NHIS could have been a young adult aged 18

to 21 years, only 14- to 17-year-olds were included in these analyses. (The family income of young adults living independently would not reflect the SES of their family of origin.) A small number of 14- to 17-year-olds (19 males and 45 females) were either married or living apart from their family. Because these living situations were rare and would be expected to influence sexual behavior, these subjects were also excluded from these analyses. Of the 4050 remaining cases, 146 adolescents (3.6%) aged 14 to 17 years did not report their sexual behavior and were also excluded. This group with missing data were systematically younger and more likely to be male, Black, and poor and to have parents with lower educational attainment. The final analytic sample included 3904 adolescents (1951 females and 1953 males) aged 14 to 17 years. Item nonresponse on independent and dependent variables within the analytic sample was  $\leq 1.0\%$  for all variables except family income, for which item nonresponse was 15.1%. Those with missing data in the analytic sample were excluded only from analyses using that item(s).

We assessed the influence of SES on the following sexual behaviors: (1) ever having had sexual intercourse, (2) sexual intercourse in the past 3 months, (3) multiple partners in the past 3 months, (4) condom use at last intercourse by the adolescent or his or her partner, and (5) oral contraceptive use at last intercourse by the adolescent or his or her partner. Each of these were dichotomous variables. Ever having had sexual intercourse was assessed from the question "Have you ever had sexual intercourse?" Sexual intercourse in the past 3 months and multiple partners in the past 3 months were assessed from a single question: "During the past 3 months, with how many people did you have sexual intercourse?" The analyses for current sexual activity, which were limited to respondents who had ever had sexual intercourse, compared those reporting no partners with those reporting 1 or more partners ( $n = 1715$ ). Analyses for multiple partners were limited to respondents who had been sexually active in the previous 3 months ( $n = 1251$ ). Because the distribution of number of sexual partners was highly skewed, we dichotomized these as 1 vs  $\geq 2$ . Separate questions queried condom use and oral contraceptive use: "The last time you had sexual intercourse, did you or your partner use a condom?" and "The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy?" Analyses of condom and oral contraceptive use were also limited to respondents who had been sexually active in the previous 3 months.

Adult respondents included parents (95%), grandparents (3%), and other adult relatives (2%). Family income was collapsed into

4 categories: less than \$20 000 per year, \$20 000 to \$34 999, \$35 000 to \$49 999, and \$50 000 or more. These categories were selected to divide the sample roughly into quartiles. Parent or guardian educational attainment, reported here as parental education, was based on the educational attainment of the most highly educated adult family member. Educational attainment was collapsed into 4 categories: less than high school, high school graduation, some college attendance, and college graduation. The correlation between family income and adult educational attainment was  $r=0.57$ . Family structure was defined as a 4-part variable: living in a 2-parent household, living with mother, living with father, or living with neither parent. Any of these arrangements may have included other adult relatives. Race/ethnicity was classified into 4 categories: White non-Hispanic, Black non-Hispanic, Hispanic, and other. Age was treated as a continuous variable.

Logistic regression was used to assess the independent influences of SES and family structure and to control for background demographic factors. Because of previous research<sup>22,26</sup> showing substantial differences in sexual behavior by sex, separate analyses were conducted for males and females. Regression analyses were performed with SUDAAN<sup>32</sup> to account for the complex, clustered sampling design. Demographic factors (age and race/

ethnicity) were entered first into each model. Next, family income, parental education, and family structure were entered into each model singly, in pairs, and then in a final model with all 3 variables to assess the best model fit. Within each final model, we assessed potential interactions between race/ethnicity and each significant variable. Statistically significant interactions were then examined in analyses stratified by race/ethnicity. Because 15% of adults in the analytic sample ( $n=591$ ) failed to report their family income, each final logistic model was computed twice, with and without family income. Case respondents with missing data on income were more likely to have parents with lower educational attainment, to live in a single-parent family or with neither parent, and to be female, Black, and older.

## Results

Weighted data on the distribution of adolescents by SES, family structure, and race/ethnicity are shown in Table 1. Most adolescents were living in 2-parent families (74%), although 21% were living with their mother only. Other family types were relatively rare, including living with the father only (2%) and living with other adult relatives but neither parent (3%). Parental educational attainment var-

ied widely; fewer than 14% of parents had not completed high school and more than one quarter had completed college. Income also ranged broadly; one quarter of families earned less than \$20 000 per year, whereas another quarter earned more than \$50 000. About 16% of adolescents were living in families with incomes below the federal poverty level as defined in 1992 (data not shown). Because the NHIS is a probability sample of families for the nation, these distributions by parental education, family income, family structure, and race/ethnicity reflect national percentages for families with adolescents aged 14 to 17 years.

In this sample of 14- to 17-year-olds, males were somewhat more likely than females to report ever having had sexual intercourse (45% vs 41%) but were less likely to report having been sexually active in the prior 3 months if sexually experienced (69% vs 77%). Condom use and having multiple partners were more common among males. Among adolescents who had been sexually active in the past 3 months, 69% of males and 49% of females reported condom use at last intercourse. In contrast, oral contraceptive use at last intercourse was reported more often by females (25%) than by males (12%). Among sexually active adolescents, 40% of males and 18% of females reported having had 2 or more sexual partners in the past 3 months.

Table 2 summarizes the effects of demographic factors, SES, and family structure on the 5 sexual behaviors in the hierarchical models. Model 1 included only the demographic variables; model 2 was the final model and included parental education, family income, and family structure, in addition to age and race/ethnicity. Table 2 presents summary *P* values for each factor (e.g., race/ethnicity); the significance of specific levels of a factor (e.g., Hispanic) is noted in footnotes or presented in Table 3 or in the text below.

Three general patterns are evident in Table 2. First, of the 5 sexual behaviors assessed, parental education, family structure, and race/ethnicity had the strongest relationship with ever having had sexual intercourse. Parental education and family structure were related to the initiation of intercourse for each gender. Second, as shown by comparing model 1 with model 2, adjustment for parental education, family income, and family structure had a limited impact on the association between race/ethnicity and sexual behavior. The association between race/ethnicity and sexual behavior was modified in 3 models: ever having had sexual intercourse among females (the association with Black race was reduced in the final model), ever having had sexual intercourse among males (the association with Hispanic ethnicity

**TABLE 1—Weighted Percentage Distribution of Demographic Characteristics Among Adolescents Aged 14–17 Years, by Sex: 1992 Youth Risk Behavior Survey Supplement to the National Health Interview Survey**

	Females (n=1951)	Males (n=1953)
Family structure		
Both parents	73.4	73.9
Mother only	22.3	20.6
Father only	1.7	2.5
Neither parent	2.6	3.1
Parental educational attainment		
<High school	13.1	13.7
High school graduate	36.6	34.0
Some college	24.5	24.0
College graduate	25.9	28.2
Family income		
<\$20 000	25.3	25.5
\$20 000–\$34 999	24.1	23.1
\$35 000–\$49 999	22.0	21.4
≥\$50 000	28.7	30.0
Adolescent age, y		
14	24.9	24.0
15	27.0	26.1
16	24.7	26.0
17	23.4	23.9
Race/ethnicity		
White	66.8	65.5
Black	15.8	15.2
Hispanic	11.8	13.3
Other <sup>a</sup>	5.6	6.1

<sup>a</sup>Includes Native Americans, Asian Americans, and those who did not identify themselves as White, Black, or Hispanic.

**TABLE 2—P Values for Sequential Logistic Regression Models for Sexual Behaviors Among Adolescents Aged 14–17 Years, by Sex: 1992 Youth Risk Behavior Survey Supplement to the National Health Interview Survey**

	Model 1 (Demographics Only)		Model 2 (Final Model)				
	Age	R/E	Age	R/E	FS	I	Ed
<b>Females</b>							
Ever had sexual intercourse	.000	.000 <sup>a</sup>	.000	.012 <sup>a</sup>	.001	.372	.002
Sexual intercourse in past 3 mo	.070	.142 <sup>b</sup>	.145	.094 <sup>b</sup>	.115	.556	.395
Condom use at last intercourse	.300	.219	.068	.186	.885	.937	.068 <sup>c</sup>
Oral contraceptive use at last intercourse	.000	.186 <sup>d</sup>	.000	.205 <sup>d</sup>	.425 <sup>e</sup>	.173	.443
≥2 sexual partners in past 3 mo	.125	.625	.061	.575	.670	.810	.303
<b>Males</b>							
Ever had sexual intercourse	.000	.000 <sup>a,d</sup>	.000	.000 <sup>a</sup>	.017	.995	.002
Sexual intercourse in past 3 mo	.000	.204	.002	.362	.503	.729	.067 <sup>f</sup>
Condom use at last intercourse	.010	.404	.020	.587	.885	.924	.054
Oral contraceptive use at last intercourse	.004	.327	.006	.456	.383	.806	.490
≥2 sexual partners in past 3 mo	.901	.018 <sup>a</sup>	.713	.577	.914	.138 <sup>g</sup>	.389

*Note.* Age = age of adolescent; R/E = race/ethnicity; FS = family structure; I = family income; Ed = parental educational attainment. *P* values were calculated with SUDAAN based on the Satterwaite  $\chi^2$  test.

<sup>a</sup>Blacks different from non-Hispanic Whites.

<sup>b</sup>Other different from non-Hispanic Whites.

<sup>c</sup>Even though the overall *P* value was not significant, a nonlinear association was found for parental education (see text).

<sup>d</sup>Hispanics different from non-Hispanic Whites.

<sup>e</sup>Adolescents living with neither parent (living with other adult relatives) different from adolescents in 2-parent family (see text).

<sup>f</sup>Nonlinear effect of parental education (see text).

<sup>g</sup>Nonlinear effect of family income (see text).

**TABLE 3—Logistic Regression Odds Ratios (ORs) and 95% Confidence Intervals (CIs) of Predictors of Ever Having Had Sexual Intercourse Among Adolescents Aged 14–17 Years: 1992 Youth Risk Behavior Survey Supplement to the National Health Interview Survey**

	Females (n = 1635)		Males (n = 1676)	
	OR	95% CI	OR	95% CI
Age	1.90***	1.69, 2.14	1.78***	1.58, 2.01
Race/ethnicity				
Other	0.68	0.35, 1.32	0.93	0.50, 1.72
Black	1.59*	1.02, 2.48	4.60***	2.97, 7.12
Hispanic	0.68	0.45, 1.02	1.15	0.81, 1.63
White	1.00		1.00	
Parental educational attainment				
<High school	2.47***	1.46, 4.19	2.58***	1.49, 4.46
High school	1.79**	1.23, 2.60	1.55*	1.05, 2.27
Some college	1.37	0.91, 2.07	1.76**	1.22, 2.52
College graduate	1.00		1.00	
Family income				
<\$20 000	1.36	0.85, 2.19	0.98	0.61, 1.59
\$20 000–\$34 999	1.15	0.78, 1.69	1.02	0.68, 1.53
\$35 000–\$49 999	1.32	0.94, 1.87	0.97	0.66, 1.43
≥\$50 000	1.00		1.00	
Family structure				
Neither parent	1.42	0.63, 3.22	2.28*	1.04, 5.00
Father only	3.24*	1.31, 8.00	2.43*	1.22, 4.83
Mother only	1.73**	1.20, 2.48	1.29	0.89, 1.87
Both parents	1.00		1.00	

\**P* < .05; \*\**P* < .01; \*\*\**P* < .001.

became nonsignificant in the final model), and multiple sexual partners among males (the association with Black race became nonsignificant in the final model). After statistical adjustment, changes were not found in other models. Third, income did not show a significant linear relation to any sexual behavior, and

only 1 model showed a nonlinear association with family income: young men from families with incomes between \$35 000 and \$50 000 were less likely to report 2 or more sexual partners (*P* = .04) than were young men from higher-income (≥\$50 000) families. Other income groups were not significantly different from

the reference group. This pattern was unexpected and may represent a chance association.

The data in Table 2 suggest several other specific, but nonlinear, patterns. First, there were nonlinear relationships between parental educational attainment and condom use among adolescent females and between parental education and sexual intercourse in the past 3 months among males. Condom use was lower among female adolescents whose parents had less than a high school education (odds ratio [OR] = 0.39; 95% confidence interval [CI] = 0.17, 0.89) or whose parents had some college education (OR = 0.46; 95% CI = 0.22, 0.97) than among those whose parents were college graduates (reference group). Condom use among adolescent females whose parents were high school graduates was not different from that among adolescent females whose parents were college graduates (OR = 0.56; 95% CI = 0.29, 1.11). Sexual intercourse in the past 3 months was more common among male adolescents whose parents were high school graduates (OR = 2.03; 95% CI = 1.09, 3.80) than among those whose parents were college graduates (reference group). Adolescents whose parents had not graduated from high school were not different from the reference group (OR = 1.27; 95% CI = 0.58, 2.79), and adolescents whose parents had some college education showed a borderline difference from the reference group (OR = 1.76; 95% CI = 1.00, 3.11). Finally, family structure was significant in predicting oral contraceptive use among females. This effect was limited, however, to the small group of adolescents who were living with neither parent

(OR=0.26; 95% CI=0.06, 0.85). Oral contraceptive use among adolescents in 1-parent families was not different from that among adolescents in 2-parent families.

We also calculated alternative final models for each behavior by removing family income. This caused minor changes in several models (data not shown). The only additional association with SES was found between parental education and recent sexual activity among females. In this association, adolescent females whose parents had less than a high school education were more likely to report recent sexual activity than were adolescent females whose parents were college graduates ( $P=.009$ ). No differences were found between adolescents of college graduates and either adolescents whose parents were high school graduates or those whose parents had some college education.

Because both parental education and family structure were strongly associated with ever having had sexual intercourse, these models were further explored in Table 3, in which the full logistic models from Table 2 for ever having had sexual intercourse are presented. Similar models were obtained for males and females, although Black race had a larger effect among males (OR=4.60; 95% CI=2.97, 7.12) than among females (OR=1.59; 95% CI=1.02, 2.48). Older adolescents, Black adolescents, and adolescents whose parents had lower levels of education were more likely to have initiated intercourse. After family structure and parental education were controlled for, income was not significantly related to initiation of sexual intercourse.

Adolescents whose parents had not completed high school were 2.5 times more likely to have had sexual intercourse than adolescents whose parents were college graduates. Intermediate levels of parental education, either completion of high school or some college attendance, were associated with 40% to 80% increased odds of having had sexual intercourse, respectively. The unadjusted prevalence of ever having had intercourse among females decreased from 53% among those whose parents did not graduate from high school to 29% among those whose parents had graduated from college. Among males, the unadjusted prevalence decreased from 60% to 34%.

Both male and female adolescents from nonintact families were also more likely to have had sexual intercourse. Adolescent females from households headed by a mother only or a father only were more likely to have initiated sexual intercourse than were adolescent females from 2-parent households. Among adolescent males, an increased likelihood of ever having had sexual intercourse was found among those living in a household headed by a father only or neither parent but not in a

household headed by a mother only. These results should be interpreted with caution, as households headed by a father or by neither parent were relatively rare, as noted above.

Significant interactions in these final models for ever having had sexual intercourse were found between parental educational attainment and Hispanic ethnicity among females and between parental education and Black race among males. Separate models (not shown) for each sex and racial/ethnic group showed no associations between parental education and ever having had sexual intercourse for these 2 groups. No other significant interactions were found.

## Discussion

SES as measured by parental education was associated with some, but not all, adolescent sexual behaviors in this group of middle adolescents. Both parental educational attainment and family structure were associated with ever having had sexual intercourse, even after other significant variables such as age and race/ethnicity were controlled for. This finding is consistent with previous research on the initiation of sexual intercourse.<sup>6,21</sup> In the current study, adolescents whose parents reported higher educational attainment were also less likely to have ever engaged in sexual intercourse. This association was not found among Hispanic females or Black males, however. The other important impact of SES was an association between parental education and condom use among females. Adolescent females with college-educated parents were more likely to have used condoms at last intercourse. We found that parental education, family structure, and race/ethnicity were not independently associated with other sexual behaviors.

Family income did not show a linear relation with any sexual behavior for males or females in our data. In contrast, Ku et al.,<sup>10</sup> using data from the National Survey of Adolescent Men, found that higher family income was associated with an increased number of sexual partners and an increased frequency of intercourse but a decreased probability of pregnancy or childbearing; they found no impact of income on use of contraception. Young men who worked more hours were more likely to be sexually active and to have impregnated a woman. Higher neighborhood unemployment was also associated with a greater risk of impregnation. These analyses did not include parental education but did include neighborhood contextual variables. Our data did not allow this level of detailed exploration.

We found that neither family structure nor parental education was associated with other adolescent sexual behaviors, including recent

sexual activity, condom use among males, oral contraceptive use, and having multiple sexual partners. Nonlinear effects were found among males for parental education and recent sexual activity and for family income and multiple sexual partners. The lack of differences by SES suggests that other factors—perhaps factors that are relatively pervasive in the culture—may have more influence on adolescent sexual behaviors. The media portrayal of sexuality, for example, is a pervasive influence that may affect adolescents from across the SES spectrum. Similarly, HIV education is also relatively universal; over 85% of adolescents report having been taught about HIV/AIDS in school or having received formal instruction about HIV/AIDS.<sup>25,26</sup>

SES is not measured in many public health surveillance systems, and race/ethnicity is often used in an uncritical manner as a proxy for socioeconomic factors.<sup>33</sup> Race/ethnicity, however, reflects many influences, including culture, discrimination, and SES; its use as a surrogate for SES may lead to stigmatization of specific groups. Two important patterns regarding race/ethnicity emerged from these data. First, for many important sexual behaviors, no significant differences by race/ethnicity were found, before or after adjustment for social factors. The past 25 years have seen enormous changes in adolescent sexual behavior, including increases in sexual experience and condom use and a decrease in oral contraceptive use.<sup>19,21,22,27,34</sup> In general, there has been a narrowing of differences in adolescent behavior by race/ethnicity.<sup>20</sup> We did find differences by race/ethnicity for initiation of intercourse, use of oral contraceptives (lower among Hispanic females), or having had multiple sexual partners (higher among Black males). Second, adjustment for SES and family structure had a limited impact on the association between race/ethnicity and sexual behaviors. After these factors were controlled for, the relation between these behaviors and race/ethnicity was diminished among Blacks in 2 models and among Hispanics in 1 model. This limited impact suggests the influence of culture as distinct from economic factors. Given the intergenerational influence of poverty and racism on culture, influences of SES and culture on sexual behavior are difficult to disentangle. Overall, our findings suggest that differences in sexual behavior by race/ethnicity cannot easily be attributed to the effect of SES.

Differences in adolescent sexual behavior by SES and race/ethnicity were not large enough to explain differences in national birth and STD infection rates, suggesting the influence of factors not measured here. Others have found that racial differences in behaviors do not explain observed differences in STD rates.<sup>35</sup> In our data, the largest effect of SES was an

approximate doubling in the percentage of adolescents who had ever had sexual intercourse. Differences in STD rates and birth rates by SES and race/ethnicity are substantially larger. These considerable differences in STD rates suggest that historical patterns of health care access may be one important influence. Because many STDs are treatable, treatment services are an important means of reducing the pool of infection in the community and of preventing secondary infection.<sup>17</sup> Lack of access to STD treatment over time would result in an increased community prevalence of these treatable STDs.<sup>17</sup> This increased prevalence would also be expected to increase the transmission of nontreatable STDs (such as HIV) through a process called epidemiologic synergy.<sup>36</sup> Adolescent involvement in STD risk behaviors in a high-prevalence community would be more likely to lead to new STD infections than would the same risk behaviors occurring among adolescents in a low-prevalence community. Current US rates of STDs by race/ethnicity reflect this reality.

A similar but more complex process may be influencing adolescent birth rates. Although adolescent birth rates are higher among poor and minority women than among more affluent women,<sup>21</sup> differences in age at initiation of sexual intercourse by parental education provide only a partial explanation. Differences in decision making about pregnancy provide an additional explanation, because adolescents from more affluent families are less likely than poor adolescents to continue a pregnancy.<sup>6,21</sup>

### Limitations

Several limitations of this study must be acknowledged. First, although cross-sectional surveys can uncover associations (or a lack thereof), they cannot determine causality. Second, these data were self-reported, including adult report of SES and family structure and adolescent report of sexual behavior. In our sample, 20% of adults failed to report family income information, reducing the utility of this variable in statistical modeling and suggesting the sensitivity of this information. Other adults may have been unable to estimate family income accurately or may have misrepresented this information. Similarly, adolescent self-report of behavioral data may overestimate or underestimate true behavior. The patterns of adolescent sexual behaviors by age and race/ethnicity reported here, however, are consistent with those found in other national surveys. Likewise, formal testing has shown good test-retest reliability for the YRBS.<sup>37</sup> However, neither the YRBS nor the NHIS provided information about parenting practices, peer influences, or factors such as self-efficacy that may be important for understanding adolescent de-

cision making about sexual behavior. The 1992 YRBS also did not provide information about community contextual variables such as income levels, which may be important influences and may not have the same effect as influences at the family level. As noted earlier, Ku et al.<sup>10</sup> found opposite effects of adolescent men's personal income and community unemployment rates on adolescent sexual behavior. Finally, although family income, parental education, and family structure are potentially important influences on adolescent health behavior, these are arguably gross simplifications of the enormous complexity of the relationship between adolescents and their families and between families and their communities.

### Implications

These data have several implications for the prevention of STD infection and unintended pregnancy among adolescents. Both well-to-do and poor adolescents are at risk for STDs and pregnancy; thus, certain prevention efforts such as health education should be universal. If sexual behavior does not fully explain differences in STD rates by race/ethnicity and SES, one must consider other factors such as access to health care. STD treatment services need to be expanded, and STD treatment needs to be targeted to communities with high prevalences of STD, communities that have traditionally lacked access to care. Expanded health care should be sensitive to the developmental needs of adolescents and young adults. The success of chlamydia screening programs in reducing the prevalence among specific populations of women and in reducing outcomes such as pelvic inflammatory disease has recently been documented.<sup>38</sup> Chlamydia screening has also been successfully implemented in urban high schools in high-prevalence communities and has shown some success over time in reducing the prevalence in the schools.<sup>39</sup> Adoption of chlamydia screening in the Health Plan Employer Data and Information Set 3.0 (HEDIS 3.0, a managed care, quality assurance system used by many managed care plans) may enhance efforts to control chlamydia among adolescents.

Differences in initiation of sexual intercourse by parental educational attainment suggest the importance of educational opportunities and aspirations in preventing unintended pregnancy among young people.<sup>40</sup> Parental expectations about success in school may protect against a variety of health risk behaviors, and adolescent connectedness to school may contribute to a delay in the initiation of sexual intercourse.<sup>41</sup> Adolescents who have high aspirations and have opportunities to implement these are less likely to contemplate early childbearing. Consequently, increasing life oppor-

tunities and fostering aspirations for young adolescents may contribute to delaying the onset of intercourse and reducing the risk of unintended pregnancy. Thus, efforts to prevent pregnancy and STDs must move well beyond the health care system to involve parents, schools, and communities. □

### Contributors

J. S. Santelli planned the study, analyzed the data, and was the primary author of the paper. R. Lowry, N. D. Brener, and L. Robin reviewed the study at each stage, including the study proposal and analysis plan, variable selection and coding, data tables, and each version of the manuscript.

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### References

1. Adler NE, Boyce T, Cheney MA, et al. Socioeconomic status and health. *Am Psychol*. 1994; 49:15–24.
2. Pappas G. Elucidating the relationships between race, socioeconomic status, and health. *Am J Public Health*. 1994;84:892–893.
3. Singh GK, Yu SM. US childhood mortality, 1950 through 1993: trends and socioeconomic differentials. *Am J Public Health*. 1996;86:505–512.
4. Brown SS, Eisenberg L. *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families*. Washington, DC: National Academy Press; 1995.
5. The Alan Guttmacher Institute. *Sex and America's Teenagers*. New York, NY: The Alan Guttmacher Institute; 1994:58.
6. Hofferth SL. Factors affecting initiation of sexual intercourse. In: Hofferth SL, Hayes CD, eds. *Risking the Future: Adolescent Sexuality, Pregnancy, and Childbearing*. Vol 2. Washington, DC: National Academy Press; 1987:7–35.
7. Singh GK, Yu SM. Infant mortality in the United States: trends, differentials, and projections, 1950 through 2010. *Am J Public Health*. 1995;85: 957–964.
8. Wu LL. *Effects of Family Instability, Income, and Income Instability on the Risk of a Premarital Birth*. Madison: Center for Demography and Ecology, University of Wisconsin; 1994. CDE Working Paper 94-07.
9. Hayward MD, Grady WR, Billy JOG. The influence of socioeconomic status on adolescent pregnancy. *Soc Sci Q*. 1992;73:750–772.
10. Ku L, Sonenstein FL, Pleck JH. Neighborhood, family, and work: influences on the premarital behaviors of adolescent men. *Soc Forces*. 1993; 72:479–503.
11. Ellen JM, Kohn RP, Bolan GA, Shiboski S, Krieger N. Socioeconomic differences in sexually transmitted disease rates among Black and White adolescents, San Francisco, 1990 to 1992. *Am J Public Health*. 1995;85:1546–1548.
12. Division of STD Prevention, Centers for Disease Control and Prevention. *Sexually Transmitted Disease Surveillance, 1996*. Atlanta, Ga: Centers for Disease Control and Prevention; 1997.

13. Ventura SJ, Curtin SC, Mathews TJ. *Teenage Births in the United States: National and State Trends, 1990–96*. Hyattsville, Md: National Center for Health Statistics; 1988. DHHS publication PHS 98-1019.
14. Low N, Daker-White G, Barlow D, Pozniak AL. Gonorrhoea in inner London: results of a cross sectional study. *BMJ*. 1997;314:1719–1723.
15. Cates W. The epidemiology and control of sexually transmitted diseases in adolescents. *Adolesc Med State Art Rev*. 1990;1:409–428.
16. Aral SO, Holmes KK. Epidemiology of sexual behavior and sexually transmitted diseases. In: Holmes KK, Mardh P, Sparling PF, et al. *Sexually Transmitted Diseases*. 2nd ed. New York, NY: McGraw-Hill; 1990:19–42.
17. Quinn TC, Cates W. Epidemiology of sexually transmitted diseases in the 1990s. *Sex Transm Dis*. 1992;19:1–37.
18. Sonenstein FL, Pleck JH, Ku LC. Sexual activity, condom use and AIDS awareness among adolescent males. *Fam Plann Perspect*. 1989;21:152–158.
19. Sonenstein FL, Ku LC, Lindberg LD, Turner C, Pleck JH. Changes in sexual behavior and condom use among teenage men: 1988 to 1995. *Am J Public Health*. 1998;88:956–959.
20. Centers for Disease Control and Prevention. Premarital sexual experience among adolescent women—United States, 1970–1988. *MMWR Morb Mortal Wkly Rep*. 1991;39:929–932.
21. Moore KA, Miller BC, Gleit D, Morrison DR. *Adolescent Sex, Contraception, and Childbearing: A Review of Recent Research*. Washington, DC: Child Trends Inc; 1995.
22. Cooksey ED, Rindfuss RR, Guilkey DK. The initiation of adolescent sexual and contraceptive behavior during changing times. *J Health Soc Behav*. 1996;37:59–74.
23. Morris NM. Determinants of adolescent initiation of coitus. *Adolesc Med State Art Rev*. 1992;3:165–180.
24. Young EW, Jensen LC, Olsen JA, Cundick BP. The effects of family structure on the sexual behavior of adolescents. *Adolescence*. 1991;26:977–986.
25. Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States, 1997. *MMWR Morb Mortal Wkly Rep*. 1998;47(SS-3):1–89 (Table 30).
26. Abma JC, Chandra A, Mosher MD, Peterson LS, Piccinino LJ. Fertility, family planning, and women's health: new data from the 1995 National Survey of Family Growth. *Vital Health Stat* 23. 1997;19:1–114.
27. Piccinino LJ, Mosher WD. Trends in contraceptive use in the United States. *Fam Plann Perspect*. 1998;30:4–10, 46.
28. Warren CW, Santelli JS, Everett SA, et al. Sexual behavior among US high school students, 1990–1997. *Fam Plann Perspect*. 1998;30:170–172, 200.
29. Ensminger ME. Adolescent sexual behavior as it relates to other transition behaviors in youth. In: Hofferth SL, Hayes CD, eds. *Risking the Future: Adolescent Sexuality, Pregnancy, and Childbearing*. Vol 2. Washington, DC: National Academy Press; 1987:36–55.
30. Adams PF, Schoenborn CA, Moss AJ, Warren CW, Kann L. Health risk behaviors among our nation's youth: United States, 1992. *Vital Health Stat* 10. 1995;No. 192:1–51.
31. Benson V, Marano MA. Current estimates from the National Health Interview Survey 1992. *Vital Health Stat* 10. 1994;No. 189:1–269.
32. Shah BV, Barnwell BG, Bieler GS. *SUDAAN: Software for the Statistical Analysis of Correlated Data; User's Manual, Release 7.0*. Research Triangle Park, NC: Research Triangle Institute; 1996.
33. Williams DR. Race and health: basic questions, emerging directions. *Ann Epidemiol*. 1997;7:322–333.
34. Forrest JD, Singh S. The sexual and reproductive behavior of American women, 1982–1988. *Fam Plann Perspect*. 1990;22:206–214.
35. Moran JS, Aral SO, Jenkins WC, Peterman TA, Alexander ER. The impact of sexually transmitted diseases on minority populations. *Public Health Rep*. 1989;104:560–565.
36. Wasserheit JN. Epidemiological synergy: interrelationships between HIV infection and other STDs. *Sex Transm Dis*. 1992;19:61–77.
37. Brener ND, Collins JL, Kann L, Warren CW, Williams BL. Reliability of the Youth Risk Behavior Survey questionnaire. *Am J Epidemiol*. 1995;141:575–580.
38. Scholes D, Stergachis A, Heidrich FE, Andrilla H, Holmes KK, Stamm WE. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. *N Engl J Med*. 1996;334:1362–1366.
39. Cohen DA, Nsumami M, Martin DH, Farley TA. Repeated school-based screening for sexually transmitted diseases: a feasible strategy for reaching adolescents. *Pediatrics*. 1999;104:1281–1285.
40. Ohannessian CM, Crockett LJ. A longitudinal investigation of the relationship between educational investment and adolescent sexual activity. *J Adolesc Res*. 1993;8:167–182.
41. Resnick MD, Bearman PS, Blum RW, et al. Protecting adolescents from harm: findings from the National Longitudinal Study of Adolescent Health. *JAMA*. 1997;278:823–832.